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Phase and structural conditions of low-temperature plasma interaction products with steel

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Abstract

© Published under licence by IOP Publishing Ltd. Structural-phase research of low-temperature plasma interaction products with carbonaceous steel is conducted in the discharge between solid electrode and water. Such a discharge at a certain electric parameters leads to a powder formation of spherical particles with a diameter 10-6 - 10-3 m. A scale on surfaces of a steel electrode and the powder synthesized from it are subjected to a comparative analysis. Qualitative and quantitative phase characteristics of these products are different and depend on conditions of their formation. Their basic phase components are various ferric oxides: magnetite Fe3O4, wustite FeO, hematite α-Fe2O3. Magnetite is contained in the powder synthesized at normal atmospheric conditions in the greatest quantity. Atmospheric pressure reduction and discharge implementation in a nitrogenous aerosphere considerably reduce quantity of magnetite in a formed powder. Diffusion speed in oxide layers and reaction temperature also influence electrode iron oxidation process. The formation mechanism of ferritic powder from steel under the influence of discharge plasma with a liquid electrode is offered on the basis of the gained results.

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